

## PubH 8492, Richly-parameterized models, Spring 2012

### Homework #5, assigned Tue 20 Mar.

In this assignment, you'll derive some specific items from our discussion of spatial confounding (the Slovenia dataset). Generally hints are in Reich, Hodges, and Zadnik (2006 *Biometrics* -- this is on the course web page along with a file describing three known typos in this paper), Hodges & Reich (2010 *The American Statistician*), and Hodges draft book Section 5.2.2 (starts on p. 102).

Page numbers below refer to my lecture transparencies, available on my web page under the heading "Part II, Section B, Collinearity & smoothing: Adding a random effect can zap a fixed effect or another random effect" (the file is named Lectures\_12.pdf).

1. Referring to p. IIB/28 of the lecture transparencies: Derive  $E(\mathbf{b} \mid \boldsymbol{\tau}_e, \boldsymbol{\tau}_s, \mathbf{y})$ ; the expression is given in Hodges & Reich (2010), p. 328, eqn (7). Remember that this is not conditional on the fixed-effect coefficient  $\beta$ .
2. Referring to p. IIB/31 of the lecture transparencies: Derive the variance inflation factor VIF for the case of a single fixed-effect predictor  $X$ . See Reich, Hodges, & Zadnik (2006), p. 1199, eqn (7) and p. 1200. Remember that  $X$  has been centered and scaled.
3. Referring to p. IIB/34 of the lecture transparencies: Derive the marginal covariance matrix  $\Sigma$  near the bottom of the page. You might find Hodges & Reich (2010) Section 2.3 helpful.

**Due Tue 27 Mar**